

Overview of Research Community Needs

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Focus questions

- What are the needs for a subseasonal NMME prediction system to be useful to the research community (both re-forecast and real-time components)?
- What are the data needs (e.g. format, frequency, flow, access, variables, etc.)?
- What are the key benchmarks you consider necessary to demonstrate success of such a system?

Multiple research communities

- S2S forecast system development
- S2S basic science & modeling research
- Applications development research

Sub-seasonal to Seasonal (S2S) Prediction Project

Sub-Projects

Interactions and teleconnections between midlatitudes and tropics

Madden-Julian Oscillation

Monsoons

Africa

Extremes

Verification

Research Issues

- Predictability
- Teleconnection
- O-A Coupling
- Scale interactions
- Physical processes

Modelling Issues

- Initialisation
- Ensemble generation
- Resolution
- O-A Coupling
- Systematic errors
- Multi-model combination

Needs & Applications

Liaison with SERA
(Working Group on
Societal and Economic
Research Applications)

S2S Database

- Monsoons
 - Develop a set of scientifically and societally relevant intra-seasonal forecast products and metrics that are applicable to all the major monsoon systems which can be monitored with operational real-time forecast systems. Case studies of monsoon onsets.
- MJO
 - Evaluate state of art & characterize shortcomings of MJO - Maritime Continent interactions. Better understand roles of multi-scale interactions, topography and land-sea contrast, and ocean/land-atmosphere coupling. In collaboration with the WGNE MJO Task Force.
- Africa
 - Develop skilful forecasts on the S2S time scale over Africa and to encourage their uptake by national meteorological services and other stakeholder groups. Link to CBS & SERA; weather-within-climate; rainfed agriculture; capacity building.

- **Extreme Weather**
 - Evaluate the predictive skill and predictability of weather regimes and extreme events (droughts, floodings, heat and cold waves). Assess the benefit of multi-model forecasting for extreme events. Improve understanding of the modulation of extreme weather events by climate modes. Sub-seasonal prediction of tropical storms (link with TIGGE-GIFS and SWFDP). Case studies selected for the strong societal impact
- **Verification**
 - Recommend verification metrics and datasets for assessing the forecast quality of S2S forecasts. Provide guidance for a potential centralized effort for comparing forecast quality of different S2S forecast systems, including the comparison of multi-model and individual forecast systems and consider linkages with users and applications.
- **Interactions & teleconnections between midlatitudes and tropics (New!)**
 - Better understand sub-seasonal tropical-extratropical interaction pathways. Identify periods and regions of increased predictability (“forecasts of opportunity”). Improve sub-seasonal to seasonal forecasts of weather and climate for applications.

Model data needs

Hindcasts

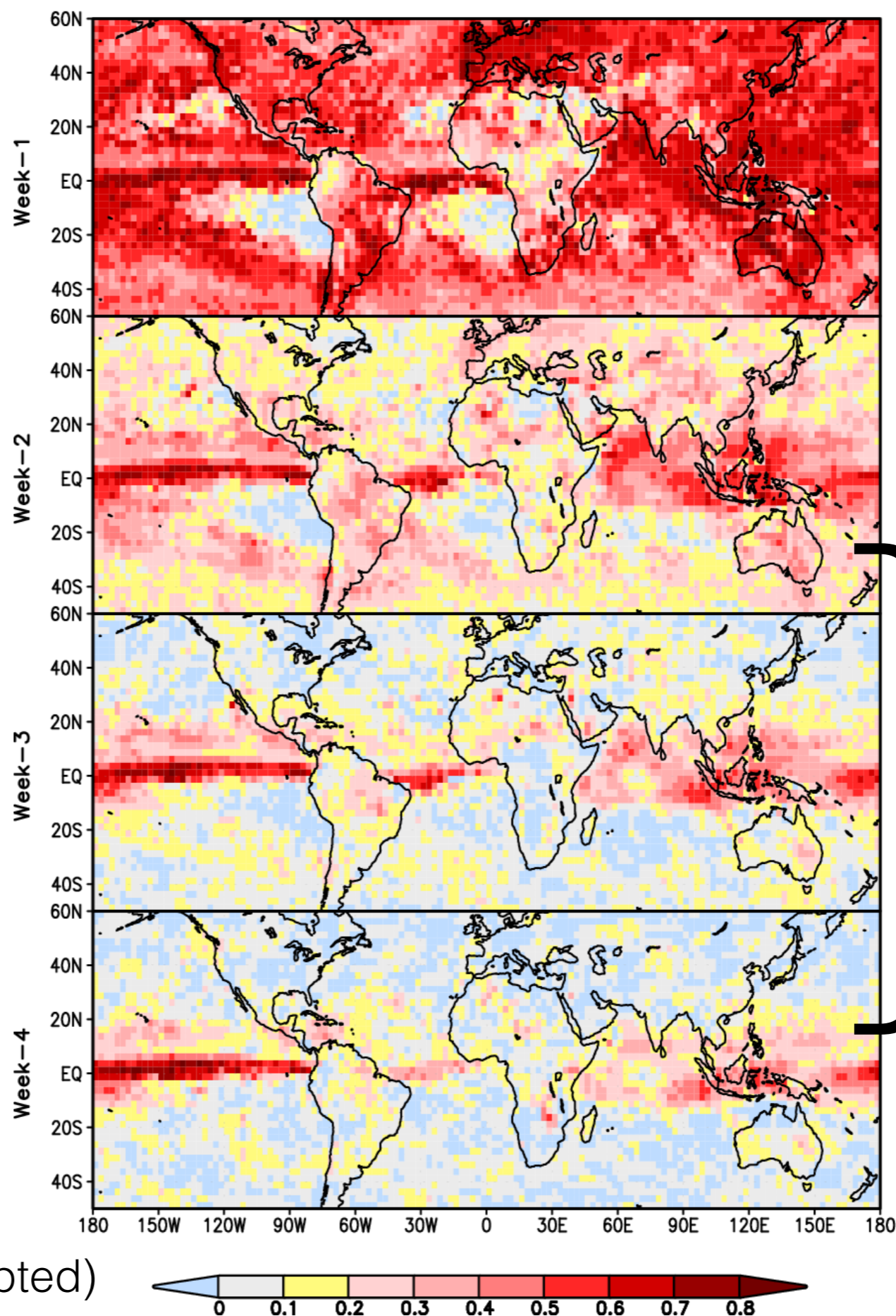
- Critical for developing user applications in the seasonal case, estimating forecast (probabilities) uncertainty and calibrating the ensemble
- Long hindcasts desirable, with reasonable number of ensemble members – forecast distribution
- Skill assessment, downscaling, statistical tailoring
- Trade-off between length of hindcasts and number of ensemble members
- 6-hr data may be needed for downscaling

	Time-range	Resol.	Ens. Size	Freq.	Hcsts	Hcst length	Hcst Freq	Hcst Size
ECMWF	D 0-32	T639/319L91	51	2/week	On the fly	Past 18y	2/weekly	11
UKMO	D 0-60	N96L85	4	daily	On the fly	1989-2003	4/month	3
NCEP	D 0-45	N126L64	4	4/daily	Fix	1999-2010	4/daily	1
EC	D 0-35	0.6x0.6L40	21	weekly	On the fly	Past 15y	weekly	4
CAWCR	D 0-60	T47L17	33	weekly	Fix	1981-2013	6/month	33
JMA	D 0-34	T159L60	50	weekly	Fix	1979-2009	3/month	5
KMA	D 0-60	N216L85	4	daily	On the fly	1996-2009	4/month	3
CMA	D 0-45	T106L40	4	daily	Fix	1992-now	daily	4
Met.Fr	D 0-60	T127L31	51	monthly	Fix	1981-2005	monthly	11
CNR	D 0-32	0.75x0.56 L54	40	weekly	Fix	1981-2010	6/month	1
HMCR	D 0-63	1.1x1.4 L28	20	weekly	Fix	1981-2010	weekly	10

ECMWF Sub-monthly forecast skill

Weekly
average
precip

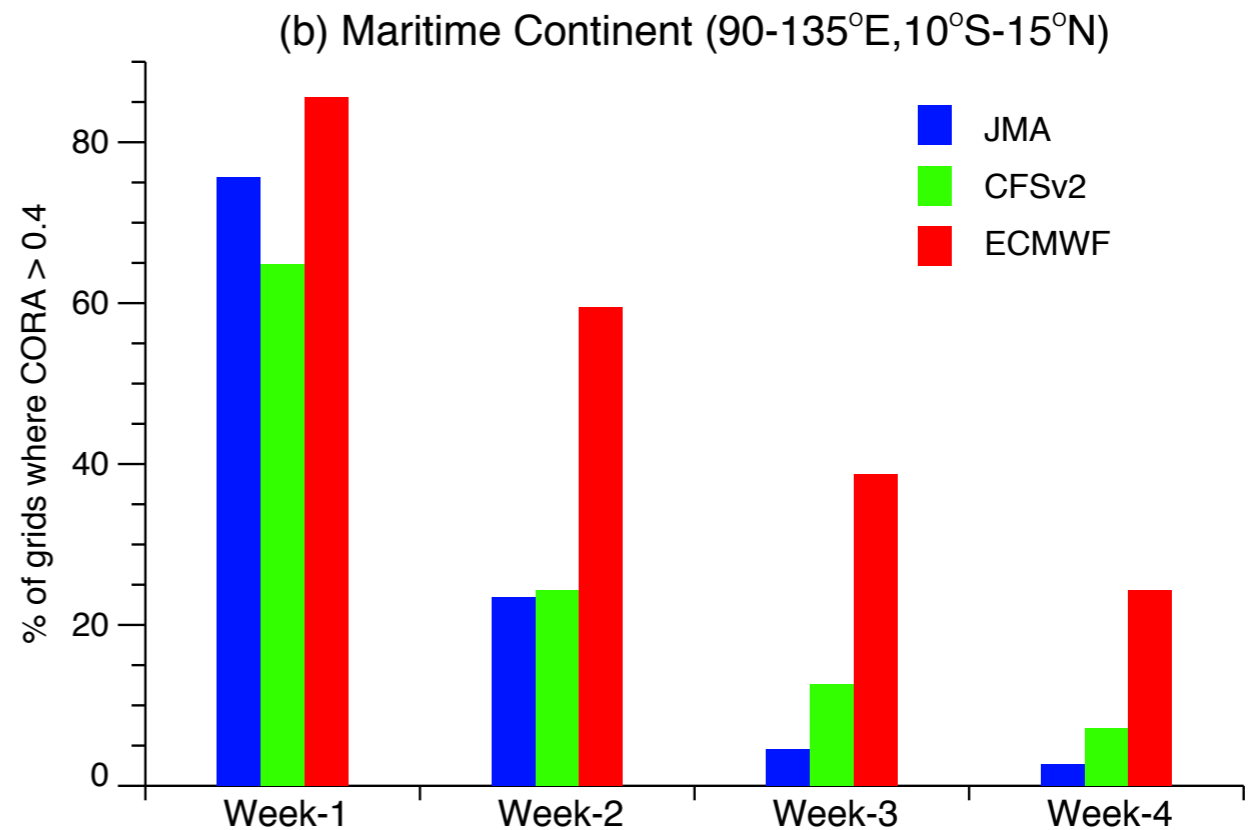
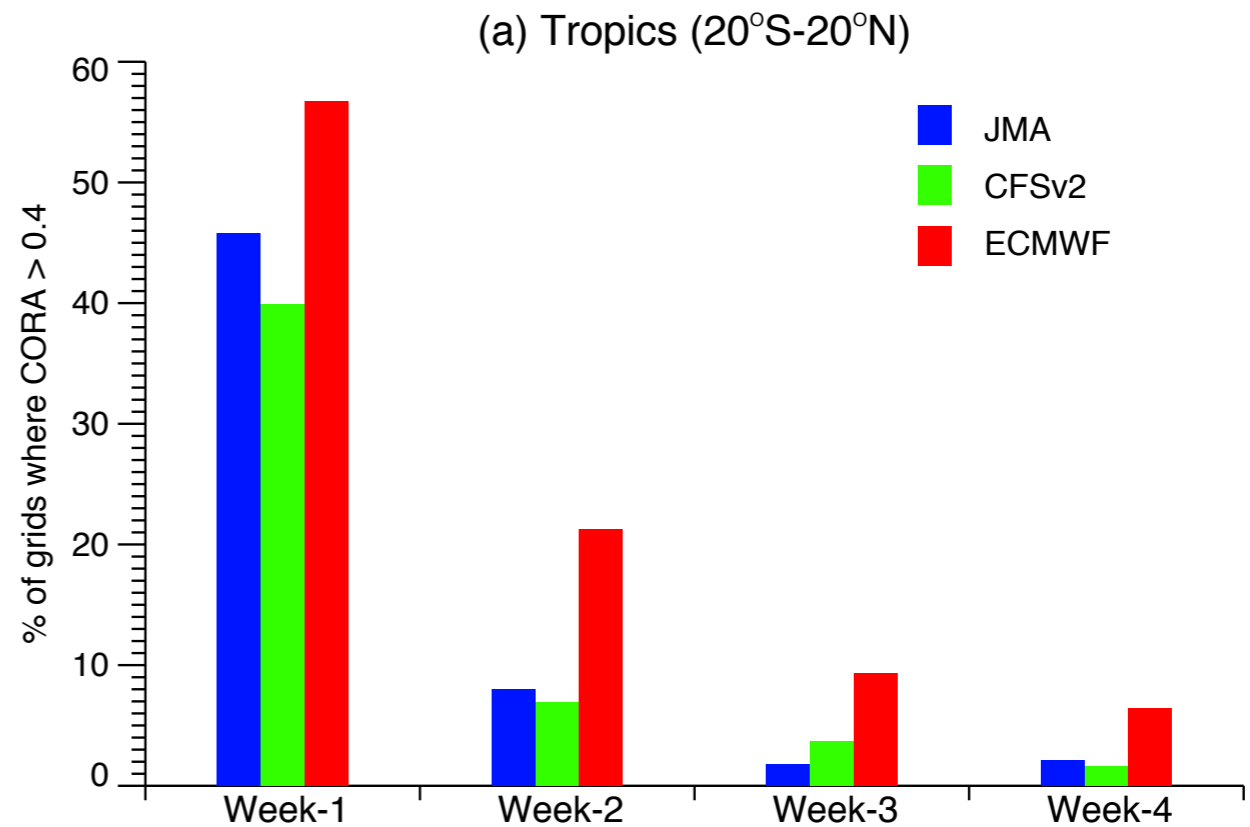
Jun–Aug
anomaly
correlation
skill



Model	Grid Resolution	Ensemble	Frequency	# of Starts	Period
JMA	144 x 73	5	3/month	13	1979–2008
CFSv2	384 x 190	4	5-day	25	1982–2010
ECMWF	360 x 181	5	weekly	18	1992–2009

- Weekly averages were constructed from the GCM daily output, and CMAP pentad data
- Ensemble sizes are small so skill measures restricted to deterministic measures
- Important role played by ENSO makes long hindcasts desirable
- Hindcast frequency differ – MME not possible

Spatial averages of Correlation of Anomalies

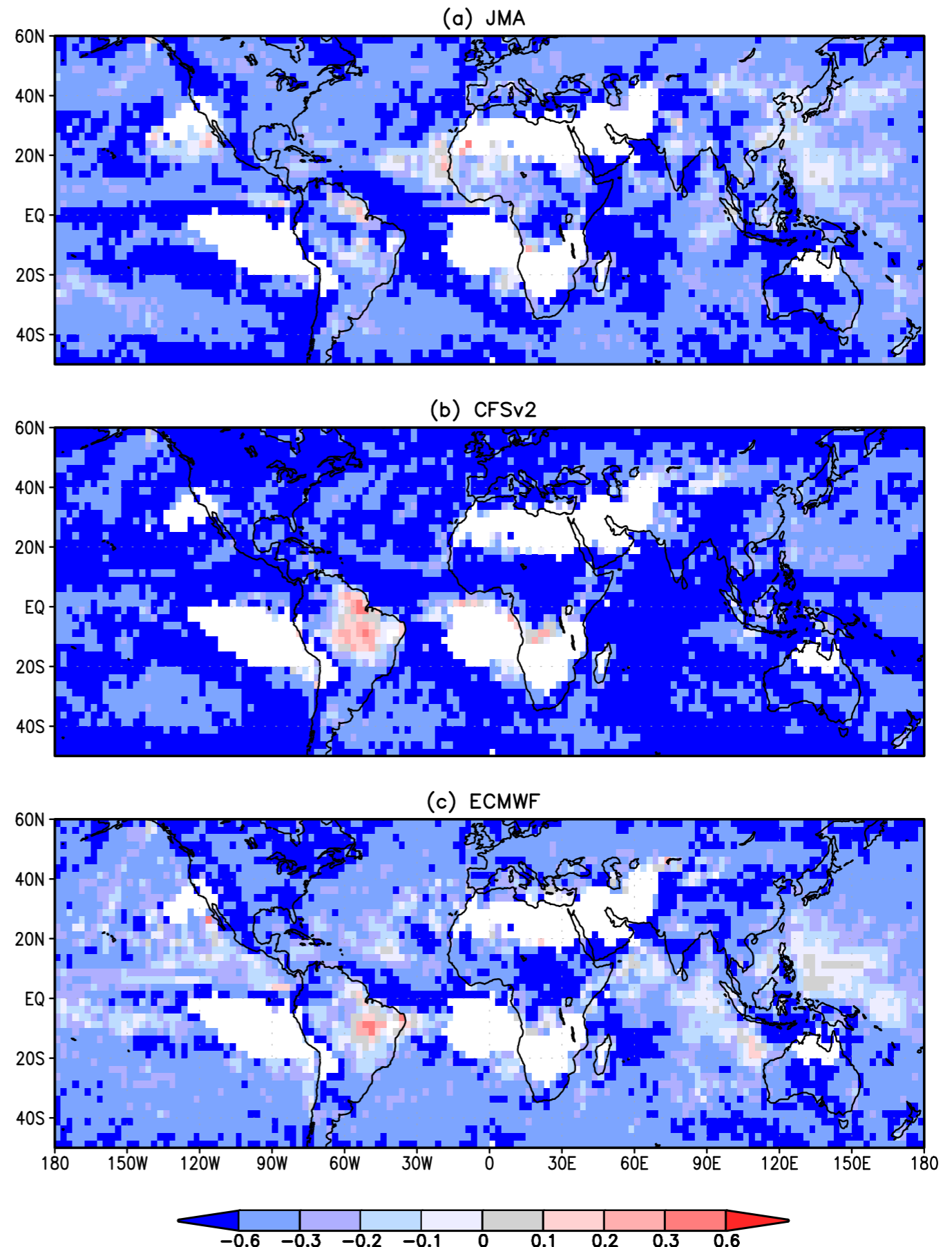


Conditional Bias

$$r - s_h/s_o$$

- Why the contrast in conditional model bias?

Precip Fcst (Week-3) vs CMAP: Conditional bias



S2S basic science & modeling research

- archiving frequency should be at least daily – only precip & T2m have sub-daily freq in S2S which may be limiting to some researchers
- archiving variables – compared to TIGGE, S2S archives additional stratospheric levels and a few ocean & land (soil moisture for at least 2 depths, variables related to the snow pack and hydrological fluxes (runoff)
- initial conditions & diabatic heating not included in S2S

Data Access

- Derived quantities may be useful, such as weekly statistics of precipitation, temperature, winds
- Verification/visualization portal?
 - statistical skill metrics
 - real-time forecasts (cf MJO)

Data Portals

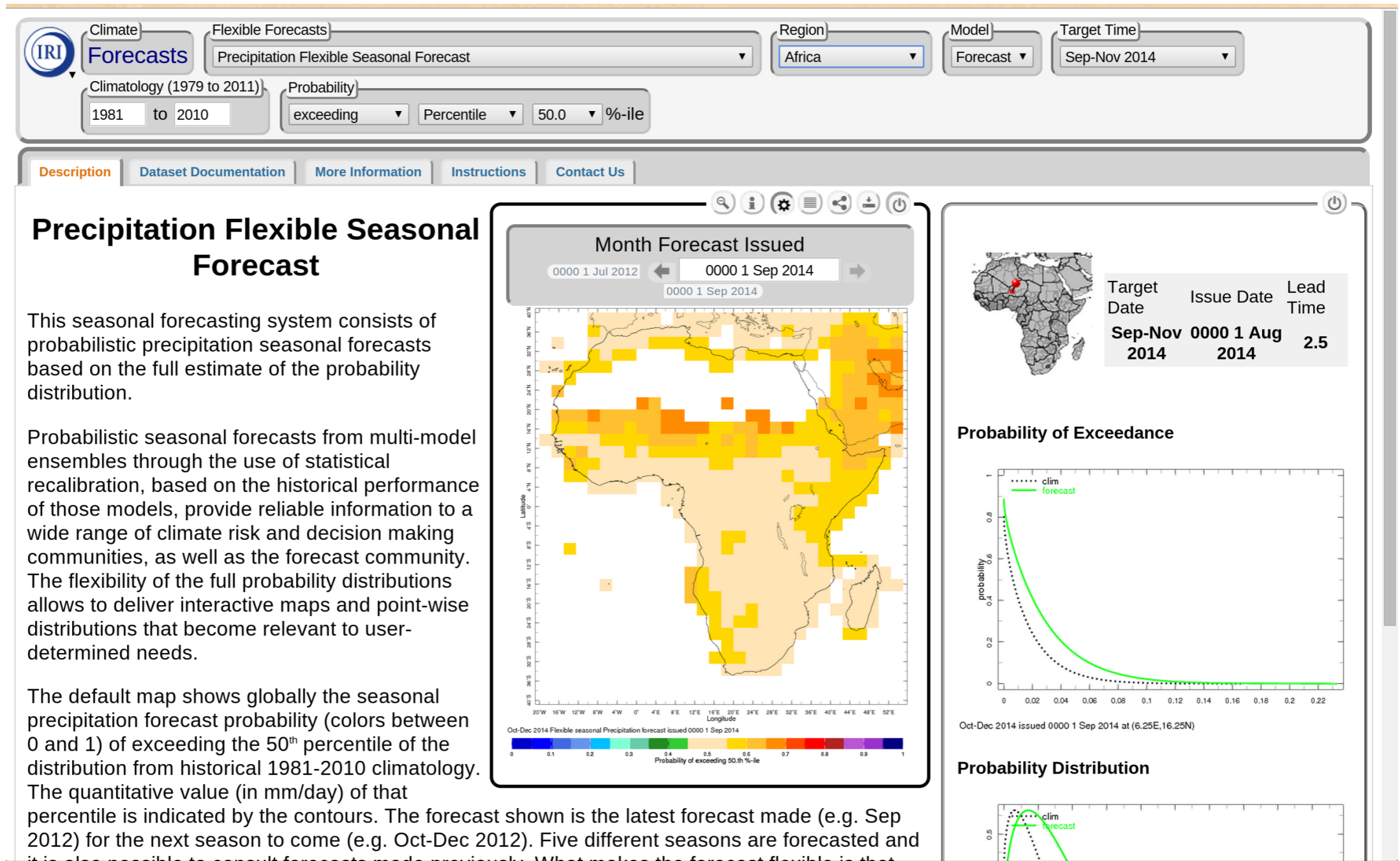


Figure 1: Sample Maproom: Precipitation Seasonal Forecast showing regional map of probability of exceeding 50% as well as probability distributions for a location chosen by clicking on the map. Region, criteria, probability level, and climatology period, can all be easily changed, and there are a variety of download and sharing options for the results.

Conclusion

- Multiple research communities (including application development) with different needs
- Observational datasets and hindcasts are stressed
- Data portals to serve research communities are important for access from multiple research communities
- Which research questions are amenable to the S2S data base of opportunity, vs those requiring a an NMME-type reforecasts database?